WHAT IS CLAIMED IS:

1. An electrochemical cell comprising:

(a) a proton exchange membrane, said proton exchange membrane having a first face and a second face;

(b) an anode, said anode having an inner face and an outer face, said inner face of said anode being positioned along said first face of said proton exchange membrane and being electrically coupled thereto;

(c) a cathode, said cathode having an inner face and an outer face, said inner face of said cathode being positioned along said second face of said proton exchange membrane and being electrically coupled thereto;

(d) a metal screen for defining a first fluid cavity, said metal screen having an inner face and an outer face, said inner face of said metal screen being placed in contact with said outer face of said anode;

(e) a compression pad for defining a second fluid cavity, said compression pad being electrically-conductive, spring-like and porous and having an inner face and an outer face, said inner face being placed in contact with said outer face of said cathode;

(f) means for axially containing fluid present within said metal screen and said compression pad; and

(g) means for peripherally containing fluid present within said metal screen and said compression pad.

2. The electrochemical cell as claimed in claim 1 wherein said compression pad comprises a mat of carbon fibers.

3. The electrochemical cell as claimed in claim 2 wherein said mat has a density of about 0.2-0.55 g/cm^3.

4. The electrochemical cell as claimed in claim 3 wherein said mat has a density of about 0.44-0.55 g/cm^3.

5. The electrochemical cell as claimed in claim 3 wherein said mat has a density of about 0.55 g/cm^3.

6. The electrochemical cell as claimed in claim 3 wherein said mat has an uncompressed thickness of about 0.08 inch.

7. The electrochemical cell as claimed in claim 5 wherein said mat has an uncompressed thickness of about 0.08 inch.

8. The electrochemical cell as claimed in claim 3 wherein said mat has an uncompressed thickness of about 0.11 inch.

9. The electrochemical cell as claimed in claim 5 wherein said mat has an uncompressed thickness of about 0.11 inch.

10. The electrochemical cell as claimed in claim 1 wherein said axially containing means comprises a first separator placed in contact with said outer face of said metal screen and a second separator placed in contact with said outer face of said compression pad.

11. The electrochemical cell as claimed in claim 10 wherein each of said separators is electrically-conductive.

12. The electrochemical cell as claimed in claim 11 wherein each of said separators is straight and wherein said peripherally containing means comprises a pair of cell frames, one of said cell frames being approximately equal in thickness to and peripherally surrounding said metal screen,

the other of said cell frames being approximately equal in thickness to and peripherally surrounding said compression pad.

13. An electrochemical cell stack comprising two electrochemical cells as claimed in claim 12, said two electrochemical cells being arranged in series in a bipolar configuration, with said first separator of one of said two electrochemical cells being in contact with said second separator of the other of said two electrochemical cells.

14. The electrochemical cell stack as claimed in claim 13 wherein each of said compression pads comprises a mat of carbon fibers, said mat having a density of about 0.2-0.55 g/cm^3.

15. The electrochemical cell stack as claimed in claim 1 wherein said compression pad comprises a mat of carbon fibers impregnated with polymeric or elastomeric materials to enhance its structural integrity and spring rate, without sacrificing conductivity and porosity.

16. An electrochemical cell comprising:

(a) first and second separators, said first and second separators being electrically conductive, being spaced apart from one another and being generally parallel to one another;

(b) a proton exchange membrane disposed between said first and second separators;

(c) an anode, said anode being positioned between said proton exchange membrane and said first separator and being electrically coupled to said proton exchange membrane;

(d) a cathode, said cathode being positioned between said proton exchange membrane and said second separator and being electrically coupled to said proton exchange membrane;

(e) a metal screen, said metal screen being positioned between said anode and said first separator and being electrically coupled to each of said anode and said first separator; and

(f) an electrically-conductive, spring-like, porous pad, said electrically-coupled, spring-like, porous pad being positioned between said cathode and said second separator and being electrically coupled to each of said cathode and said second separator; and

(g) a pair of cell frames, one of said cell frames being in peripheral contact with said metal screen, the other of said cell frames being in peripheral contact with said electrically-conductive, spring-like, porous pad.

17. The electrochemical cell as claimed in claim 16 wherein said electrically-conductive, spring-like, porous pad comprises a mat of carbon fibers.

18. The electrochemical cell as claimed in claim 17 wherein said mat has a density of about 0.2-0.55 g/cm^3.

19. The electrochemical cell as claimed in claim 18 wherein said first and second separators are straight in cross-section and serve to axially contain fluid present within said metal screen and said electrically-conductive, spring-like, porous pad, respectively, wherein said first cell frame has a thickness approximately equal to the thickness of said metal screen so that said first cell frame serves to peripherally contain fluid within said metal screen, and wherein said second cell frame has a thickness approximately equal to the thickness of said electrically-conductive, spring-like, porous pad so that said second cell frame serves to peripherally contain fluid within said electrically-conductive, spring-like, porous pad.

20. The electrochemical cell as claimed in claim 18 wherein said first cell frame has an outer face and a thickness greater than that of said metal screen, wherein said second cell frame has an outer face and a thickness less than that of said electrically-conductive, spring-like, porous pad, wherein said first separator is bent so that its periphery is coupled to the outer face of said first cell

frame and its midsection is in contact with the outer face of said metal screen, and wherein said second separator is bent so that its periphery is coupled to the outer face of said second cell frame and its midsection is in contact with the outer face of said electrically-conductive, spring-like, porous pad.

21. The electrochemical cell stack as claimed in claim 16 wherein said electrically-conductive, spring-like, porous pad comprises a mat of carbon fibers impregnated with polymeric or elastomeric materials to enhance its structural integrity and spring rate, without sacrificing conductivity and porosity.

22. An electrochemical cell stack comprising:

(a) a first proton exchange membrane, said first proton exchange membrane having a first face and a second face;

(b) a first anode, said first anode having an inner face and an outer face, said inner face of said first anode being positioned along said first face of said first proton exchange membrane and being electrically coupled thereto;

(c) a first cathode, said first cathode having an inner face and an outer face, said inner face of said first cathode being positioned along said second face of said first proton exchange membrane and being electrically coupled thereto;

(d) a first metal screen, said first metal screen having an inner face and an outer face, said inner face of said first metal screen being placed in contact with said outer face of said first anode;

(e) a first compression pad, said first compression pad being electrically-conductive, spring-like and porous and having an inner face and an outer face, said inner face of said first compression pad being placed in contact with said outer face of said cathode;

(f) a first cell frame, said first cell frame being in peripheral contact with said first metal screen, said first cell frame having a thickness greater than that of said first metal screen;

(g) a second cell frame, said second cell frame being in peripheral contact with said first compression pad, said second cell frame having a thickness less than that of said first compression pad;

(h) first and second separators, each of said first and second separators being electrically conductive wherein said first separator is bent so that its periphery is coupled to the outer face of said first cell frame and its midsection is in contact with the outer face of said metal screen, and wherein said second separator is bent so that its periphery is coupled to the outer face of said second cell frame and its midsection is in contact with the outer face of said electrically-conductive, spring-like, porous pad;

(i) a second proton exchange membrane, said second proton exchange membrane having a first face and a second face;

(j) a second anode, said second anode having an inner face and an outer face, said inner face of said second anode being positioned along said first face of said second proton exchange membrane and being electrically coupled thereto;

(k) a second cathode, said second cathode having an inner face and an outer face, said inner face of said second cathode being positioned along said second face of said second proton exchange membrane and being electrically coupled thereto;

(l) a second metal screen, said second metal screen having an inner face and an outer face, said inner face of said second metal screen being placed in contact with said outer face of said second anode, said outer face of said second metal screen being placed in contact with the midsection of said second separator;

(m) a second compression pad, said second compression pad being electrically-conductive, spring-like and porous and having an inner face and an outer face, said inner face of said second compression pad being placed in contact with said outer face of said second cathode;

(n) a third cell frame, said third cell frame being in peripheral contact with said second metal screen, said third cell frame having a thickness greater than that of said second metal screen;

(o) a fourth cell frame, said fourth cell frame being in peripheral contact with said second compression pad, said fourth cell frame having a thickness less than that of said second compression pad; and

(p) a third separator, said third separator being electrically conductive and being bent so that its periphery is coupled to the outer face of said fourth cell frame and its midsection is in contact with the outer face of said second compression pad.

23. The electrochemical cell stack as claimed in claim 22 wherein each of said first and second compression pads comprises a mat of carbon fibers.

24. The electrochemical cell stack as claimed in claim 23 wherein said mat has a density of about 0.2-0.55 g/cm^3.

25. The electrochemical cell stack as claimed in claim 24 wherein each of said first and second compression pads has an uncompressed thickness of about 0.11 inch, wherein each of said

first and second metal screens has a thickness of about 0.035 inch and wherein each of said first, second, third and fourth cell frames has a thickness of about 0.06 inch.

26. The electrochemical cell as claimed in claim 22 wherein each of said first and second compression pads comprises a mat of carbon fibers impregnated with polymeric or elastomeric materials to enhance its structural integrity and spring rate, without sacrificing conductivity and porosity.